

2/9/5 (Item 1 from file: 653)  
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Utility

GUIDE DEVICE FOR A TEST BODY OF A HARDNESS MEASURING INSTRUMENT

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ABSTRACT

A device for guiding a hardness test body has a first bar device supporting the test body on one end, the geometric central axis of the bar device passing through the middle of the test body, and a second bar device which is substantially perpendicular to the first bar device. The second bar device comprises two flat broad leaf springs which are disposed parallel and at a considerable distance from each other with the light direction in the geometric central axis. A rigid bearing block of considerable height is immovable in the measuring position and extends parallel with the central axis. One end of the leaf springs is rigidly clamped on the bearing block. The other end of the leaf springs is rigidly connected to the first bar device which extends at least over the distance between the leaf springs. The effective length of the leaf springs is the same. A third bar device lies between the leaf springs and is pivotably mounted through the bearing block, with one end connected to the first bar device and compensating weights on the other end.

## DESCRIPTION OF THE DRAWINGS

The invention will now be explained with reference to a preferred embodiment shown in the accompanying drawings, in which:

FIG. 1 is a partially exploded side view of the device according to the invention;

FIG. 2 is a view according to the arrow 2 in FIG. 1;

FIG. 3 is a section taken on the line 3--3 in FIG. 1;

FIG. 4 is a section taken on the line 4--4 in FIG. 1;

FIG. 5 is a section taken on the line 5--5 in FIG. 1;

FIG. 6 is a view of a leaf spring serving a pivot joint;

FIG. 7 is a view according to the arrow 7 in FIG. 6, partly broken away to illustrate the action of the leaf spring in FIG. 6;

FIG. 8 is a section through the right-hand bottom part of the tube shown on the right in FIG. 1, and

FIG. 9 is a perspective overall view of a hand-held instrument, partly opened.

This invention relates to a device for guiding a test body of a hardness measuring instrument.

## BACKGROUND OF THE INVENTION AND RELEVANT PRIOR ART

Such a device is known from German published specification No. P 3408554.8 (U.S. Pat. No. 4,671,104, and U.S. Pat. No. 4,691,559, English Pat. No. 2155639, Japanese published specification No. 75655/84). According to U.S. Pat. No. 4,691,559 FIG. 1 thereof, a test body 67 is provided from which a first bar device emerges vertically upwardly and merges into a second horizontal bar device 37. Here, the geometric central axis 21 is important. The second bar device 37 is mounted on a bearing device in the form of the rotor of a rotary magnet device 31. The disadvantages of this arrangement are as follows:

(a) There is friction in the bearing of the rotary magnet.

(b) It is true that the second bar device 37 is comparatively long, although by virtue of problems with mass and the problem of usefulness as a hand-held appliance soon applies limits to the length; nevertheless, upon a rotation as indicated by the arrow 39, the direction of the first bar device changes in relation to the geometric longitudinal axis 21, so that that side of the test body 67 which is closer to the rotary magnet 31 is pressed in that direction. However, the first bar device ought to remain in the geometric central axis 21 or only undergo a parallel translatory displacement, and then only by an amount which can be disregarded from the point of view of measurement technique.

(c) Measurement of hardness can be described as a method which derives results from finding out how a material behaves when subject to the action of force. By reason of the aforesaid properties, however, it is not with the prior art device possible to this degree to record the depth profile of the hardness. The hardness is particularly of interest right in the vicinity of the surface and to this end, the prior art device is not sensitive enough.

Devices of the relevant prior art include the following features:

A first bar device having an end portion and a geometric central axis.

A test body supported on the end portion, the geometric central axis of the first bar device passing through the middle of the test body.

A bearing device.

And, a second bar device substantially perpendicular to the first bar device, having one end portion rigidly connected to the first bar device and another end portion fixed in the longitudinal direction of the second bar device in such a way as to be immovable on the bearing device, the bearing device being immovable in the longitudinal direction of the second bar device.

#### OBJECT AND STATEMENT OF THE INVENTION

The object of the invention is to provide a device which can still be constructed to the size of a hand-held instrument but which avoids the aforementioned drawbacks.

According to the invention, this object is achieved by the following features:

(a) The bearing device is a rigid bearing block of considerable height, which is immovable when the device is in the measuring position and which extends parallel to the geometric central axis of the first bar device,

(b) The second bar device comprises two flat broad-leaf springs that are disposed parallel with and at a considerable distance from each other, having a light direction in said geometric central axis,

(c) The broad-leaf springs have one end zone rigidly clamped on the bearing block,

(d) The broad-leaf springs have another end zone rigidly connected to the first bar device, and the first bar device extends at least over the distance between the broad-leaf springs, and

(e) The effective lengths of the broad-leaf springs are the same.

Such an embodiment eliminates friction. The geometric central axis of the test body always remains parallel with the geometric central axis of the first bar device. The lateral offset between the moment of application to the surface of the material to be tested up to the highest stepwise applied force is in practice less than 1 nanometer and can thus be disregarded. The system is ideal insofar as without any naturally required damping, it is for practical purposes undamped in itself, which can be seen in that it undergoes secondary vibration for quite some time after impact. A reproducibility of 0.1 milli-Newtons to 1 Newton can be achieved. Leaf springs of the order of 1 cm width are in the heavy direction so rigid that the first bar device remains laterally unmoved, so that the test body penetrates the surface at a right-angle even with inhomogenous material, and does not slip off sideways.

The following additional features are described in a preferred embodiment.

The broad-leaf springs have a position of rest in which they are free from tension. This makes it possible to avoid the "frog clicker" effect which can happen with leaf springs. For instance, this would be the case if the leaf springs were to be stamped out, because then at least one stamping burr would occur somewhere or another. The leaf springs must be absolutely flat and have homogeneous properties over their entire width. Even when they are cut with shears or a guillotine, the cut edges would lead to inhomogenous properties. However, it is not necessary for the leaf springs to be orientated according to the direction of the fibers in the microstructure.